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# UNION PACIFIC RAILROAD.

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# GEOLOGICAL & AGRICULTURAL SURVEY

OF

# 100 MILES WEST OF OMAHA.

BY

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## Office of the American Bureau of Mines,

No. 44 Exchange Place,

*New York, August 23d, 1866.*

T. C. DURANT, Esq.,

Vice-President Union Pacific Railroad.

Dear Sir:

The American Bureau of Mines, having at your instance undertaken the Geological and Agricultural examination of the lands of the Union Pacific Railroad Company for one hundred miles west of Omaha, has the honor to transmit the accompanying Report of the Board of Experts.

GEO. D. H. GILLESPIE,

*President.*

GEO. R. A. RICKETTS,

*Secretary.*

OFFICE OF THE BOARD OF EXPERTS
OF THE AMERICAN BUREAU OF MINES.

*New York, August 23d, 1866.*

GEO. D. H. GILLESPIE, ESQ., President Board of Trustees.

DEAR SIR:

The Board of Experts having received from you a commission to examine the Geology and Agriculture of the first 100 miles of the Union Pacific Railroad, Prof. THOS. EGLESTON, Jr., was charged with the personal reconnoissance of the ground. The unanimous report of this Board, embodying the results of his examination, is herewith respectfully submitted.

Prof. Egleston desires thanks to be given to his Assistants, Messrs. Hale, Harmer, and Chester, students of the School of Mines of Columbia College; to Capt. Hollins, guide of his party; to the officers of the Railroad Company, and to the citizens of Nebraska generally, who were everywhere ready to facilitate his survey.

For the Board of Experts,

J. P. KIMBALL, *Vice-Pres.*

R. W. RAYMOND, *Secretary.*

# REPORT

ON THE

# Geology and Agriculture of the First Hundred Miles

OF THE

# UNION PACIFIC RAILROAD.

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## TOPOGRAPHY.

Omaha, the capital of Nebraska Territory, and the eastern terminus of the Union Pacific Railroad, is situated on the Missouri River, at 41°15′ north latitude, fifteen miles above its junction with the Platte. It is very nearly in the middle of the river-front of the Territory, and 1000 feet above the level of the sea. The surface of the Territory gradually rises to the North and West, and at Fort Kearney, 175 miles west, the elevation is 2,360 feet. It nowhere attains an elevation that can be called a mountain, but rises gently in a series of low table-lands and rolling hills. The general direction of the Missouri River is a little E. of S. The Platte has the general direction of N. E., though it varies very much in its course, running sometimes S., and even S. E. Almost all of the larger streams north of the Platte flow into it. In the northern part of the Territory, a few flow directly into the Missouri. The Missouri River, therefore, does not affect the topography of the eastern part of the country, except within a few miles of its bluffs, its divide being usually from six to ten miles from the river in Nebraska. In Iowa it affects the country much further East.

The tributaries of the Platte on its north side are quite large, and divide the country into several distinct valleys, each one having its own water-shed, and varying in its features with the size of the stream.

The largest of these streams within the first one hundred miles are the Elkhorn on the East, and the Loup Fork on the West. Between the Elkhorn and the Missouri is the smaller valley of the Papillon, and between the Elkhorn and the Loup Fork that of Shell Creek.

South of the Platte River, the streams which flow into it are generally small. The only ones of any importance are Skull Creek and Salt Creek. The other streams of any size are either tributaries of these, or flow into the Blue, which is a tributary of the Kansas River.

It will thus be seen, that, topographically, the Platte is the most important river of Nebraska. It has no other importance, however, as its stream is very rapid and shallow, changing its channel often. It is obstructed in all directions with shifting sand-bars, and is too dangerous to allow of its being navigated.

On the north side of the Platte the general direction of its tributaries is S. E.; while their tributaries are generally nearly parallel to the Platte.

This disposition of the rivers of the Territory would seem to indicate at least two series of geological disturbances nearly at right angles to each other; but no trace of water-courses formed by rupture of the surface can be seen in any of the rocks. Where they are exposed to view, they exhibit but very slight marks of disturbance. The dip of the rock is constant, and apparently never as great as one degree.

The river-valleys appear to be exclusively valleys of erosion, and their formation can be seen at the present time going on both on a large and small scale all over the country.

Most of the streams on the north side have high earth banks, and, like the Missouri and Platte Rivers, rapid currents. They are subject to great fluctuations in their height, rising and falling rapidly; and their waters are rarely, if ever, clear.

Skull and Salt Creeks, on the South side, have, however, rock bottoms and clear water.

All of the smaller streams have in turn their tributaries. These are frequently dry, except just after a rain, and are usually nothing more than the channel of the waters flowing from the surface. These, however, as well as the continuously flowing streams, have their rise in slight depressions in the surface, which would not be detected by the eye, except for the direction of the current.

It will thus be seen that the country is cut up into a series of valleys running at angles to the Platte, which correspond in size and importance to the rivers flowing through them. These main valleys are intersected by the valleys of the tributary streams,

and these again by others, giving rise to that peculiar structure of the surface known as rolling prairie.

In ascending any one of the streams, we find a rich valley, which is more or less broad according to the position and importance of the stream which flows through it. This valley is usually called the bottom. The banks of the larger streams are generally quite low, and are separated from the bottoms proper by a terrace of varying width. It is from two to three feet high, and forms the banks of the stream. The bottoms proper commence with the next terrace, which is of about the same height. The width of these bottom-lands on the Missouri River varies from six to eight miles; on the Platte from three to six; on the tributaries of the Platte they vary from one to two. They are composed of rich alluvial soil, and are in many cases covered with timber, when the bottoms are liable to overflow. The smaller streams also have bottoms. Their banks are often fifteen or twenty feet high, and are almost always of earth. They show the general tendency of the soil to assume a vertical position rather than a talus. There is usually but one terrace, and that is the bottom proper. All these small streams are subject to great fluctuations, but rarely leave their banks. The bottoms are never so wide as on the larger streams, and their banks are usually covered with "openings" of hard timber.

The Platte rarely leaves its banks. Its tributaries, where they enter the Platte bottoms, are liable to overflow in the spring freshets, or after a very heavy and long-continued rain.

From the bottoms proper there is a gradual rise to the bluffs of the third terrace. The height of this terrace above the river is about fifty feet at Omaha. The city is built upon it. The bluffs proper of the river are at the foot of a fourth terrace. They are of variable height. At Council Bluffs they are 225 feet above the level of the third terrace. They consist in a series of low ascending hills, which constitute the divide of the waters of the region. The divide between two streams is always broken up by the valleys of other streams which are tributary to them. The top of the divide from which the waters actually flow in different directions, is called the "back-bone," and is usually very irregular and crooked.

Upon this back-bone almost all the roads of the country are built. They follow, in most cases, old Indian trails, and are

generally the most expeditious routes of travel, since they present the least incline, and allow of carrying the maximum load.

This disposition of the valleys of the streams in terraces grows indistinct as we go west, and is frequently limited to the first and the fourth.

It frequently happens that in the bottom-lands there are spots which fall below the level of the rivers or of any drainage. These places give rise to sloughs, which may be of almost any size. Sometimes they are simply the collection of surface-waters, and dry up after a rain; sometimes they are supplied by springs, and at others they are caused by the obstruction at one or both of their ends of the former channel of the river. These support their own fish, and never dry, except when the bed of the stream dries. Sometimes such sloughs are from a quarter to half a mile in length, and from fifty to a hundred feet wide. They do not appear to have any connection with the river, but their water is of the same temperature, and clear. They are probably supplied by filtration through the gravel which underlies the whole of the bottoms at the depth of ten or fifteen feet.

All the streams, whether large or small, take their rise in slight depressions in the high rolling prairie, which are either sloughs or springs. These are sometimes well defined, and sometimes only low moist ground, in which the stream is formed imperceptibly, small disconnected sloughs appearing at first, growing larger and at shorter intervals, until gradually the banks of the stream assume a defined form. It is frequently difficult to determine the direction of the flow of the water at the head of these streams, so very slight is the inclination of the surface. The water in such streams has usually about the temperature of the air. This method of formation is particularly noticeable at the head of Calahan Creek, south of the Platte. As the banks of the stream become well marked, and deepen, it commences to form bottoms. These usually commence in a bend of the stream upon the concave side. As the bottoms are entirely alluvial, the stream is continually varying its banks and changing its channel. As the curves in the rivers embrace very large tracts of rich land which are protected from fires, the bottoms produce a very large amount of timber. The banks and narrow bottoms of the smaller streams are covered with brush and some oak and other trees, which are either in clumps or scattered so as to

form "openings," and do not prevent the cultivation of the ground. Occasionally, these trees will be found at a little distance from the banks of the stream, and in the same direction. It is unusual to find them at any great distance, since they then lose protection from the prairie-fires.

Many of the sloughs in the bottoms are being slowly filled up either by the turbid waters which deposit their mud there after an overflow of the rivers, by the accumulations of wash when they are near a hill, or of the decaying vegetation from their own sides. Many bogs of this character were noticed. All of them will furnish excellent top-dressings for the soil.

In some of these places there were indications of valuable beds of peat. Some of them have taken fire in dry times, and burned a considerable distance below the surface.

Some of the springs have medicinal qualities. That of Saratoga is the most noted one. It is a sulphurous spring, containing carbonates and sulphates in solution. Some of the springs near De Soto appear to be of the same character.

We frequently detected traces of sulphur in the water. The bases which were usually detected with them were potash, soda, and iron. Wherever the springs pass near a layer of slate or coal, they form a slough which is colored by hydrated sesquioxide of iron.

## GEOLOGY.

The Territory of Nebraska shows, within the boundaries of this survey, only two of the geological formations: the Carboniferous and the Cretaceous. Evidences of extensive action of a later age also exist in the shape of drift, and deep valleys of erosion.

### CARBONIFEROUS PERIOD.

The Carboniferous period is represented by a series of highly fossiliferous limestones, filled in many places with bands and nodules of silex, alternating with shales, which crop out along the bluffs of the Missouri and Platte Rivers and some of their tributaries. The highest point North at which they were observed was at Rockport, about 10 miles above Omaha, where the limestone forms the bed of the river. They crop out in the bluffs at Omaha, at

Bellevue, and at Plattsmouth. At Nebraska City the bluff shows a succession of shales and limestones. The best place for their examination is at Bellevue, where they form the bank of the river for more than a quarter of a mile, and on the north bank of the Platte, near its mouth, where they crop out in the bluffs at short intervals for ten or twelve miles. These limestones vary from light yellow to blue, and furnish all the building-stone of the country.

They contain the following fossils, which were identified by F. B. Meek, Esq., of the Illinois Geological Survey:

## CARBONIFEROUS FOSSILS.

*Fish teeth.* Watson's Quarry.
*Philipsia* ————. Plattsmouth.
*Nautilus Illinoensis?* Plattsmouth.
*Macrochielus inhabilis.* Bellevue.
*Bellerophon carbonaria.* Pawnee Creek.
" ————. Plattsmouth Ferry.
*Pleurotomaria spherulata.* Bellevue.
*Myalina subquadrata?* Shumard. Rockport, Bellevue, and Calihan Creek.
" *ampla.* Plattsmouth.
*Solenomya* ————. Plattsmouth Ferry.
*Allorisma inequalis.*
*Productus punctatus*, Martin sp. = *Productus tubulo-spinus*, McChesney; *P. semipunctatus*, Shepard. Bellevue and Rockport.
" *equicostatus*, Shumard. Bellevue, Rockport, and Plattsmouth.
" *Nebrascensis*, Owen. = *P. Rogersi*, Norwood and Pratten; *P. asper*, McChesney. Bellevue, Plattsmouth, Pawnee Creek, and Calahan Creek.
" *costatus*, Sowerby. Omaha, Bellevue, Larimer, Plattsmouth, Plattsmouth Ferry, Salt Creek, and Pawnee Creek.
" *semireticulatus*, Martin sp. = *P. Calhounianus*, Swallow. Omaha, Bellevue, Watson's Quarry, and Pawnee Creek.
" *longispinus*, Sowerby. = *P. Wabashensis*, Norwood and Pratten.

*Productus symmetricus*, McChesney. Bellevue.
" *Prattennianus.* Watson's Quarry.
*Athyris subtileta*, Hall. Rockport, Omaha, Bellevue, Larimer, Dyson's Hollow, Sauntee, Plattsmouth, Pawnee Creek, and Salt Creek
*Spirifer cameratus*, Morton.=*S. triplicatus*, Hall; *S. Meusebachanus*, Roemer. Bellevue, Larimer, Dyson's Hollow, Watson's Quarry, Plattsmouth, and Pawnee Creek.
" *lineatus?* Watson's Quarry, and Plattsmouth.
" *planoconvexus.* Pawnee Creek.
" *Kentuckiensis.* Pawnee Creek.
*Chonetes mucronata*, M. & H. Pawnee Creek.
*Terebratula bovidens*, Morton. Pawnee Creek.
*Rhetzia punctillifera*, Shumard. Plattsmouth Ferry and Pawnee Creek.
*Hemipronites crenostria.* Watson's Quarry.
" *striatocostatus.*
*Archæocidaris* ————. Dyson's Hollow and Plattsmouth.
*Erisochrinus types.* Pawnee Creek.
*Zaphrentis.* Plattsmouth Ferry.
*Favosites.* " "
*Zochrinus.* " "
*Fusalina cylindrica.* Bellevue, Larimer, Plattsmouth, Salt Creek, and Pawnee Creek.

These fossils show the strata to belong to the upper Carboniferous. The rocks all dip northwest, but at such a slight angle as to make them fall only a few feet to the mile, not more than two or three. They are so nearly level, that it is impossible without an instrumental observation to see that they dip at all. They appear to keep very nearly the level of the Missouri River, which descends about one foot to the mile. The dip is proven, however, not only by instrumental measurement, but by the fact that as we go west or north, we find the more recent formations appearing, while the Carboniferous has passed completely out of view at the distance of a few miles. The rise in the level of the country is not sufficient to account for this, as the thickness of the overlying formations will more than counterbalance it.

If we follow the Platte River from its mouth, we shall find these limestones cropping out in both bluffs. As we go west on the north bank, we find them well developed at Larimer's Mills

and at Dyson's Hollow, where there are extensive quarries. As we approach Buffalo Creek, we begin to find occasional boulders of a coarse red sandstone, and further on we find it in place on the top of the hills, with the limestone below it. At Sauntee, where the river runs south, this sandstone forms bluffs which are over forty feet high. Here it shows no traces of fossils of any kind; further north, however, it contains impressions of dicotyledonous plants of Cretaceous species.

On the south bank of the river these limestones can be seen as far west as the bed of Salt Creek. The hills here are much higher than on the north bank, and the sandstone commences to appear in their tops as far east as Cedar Island.

At Bellevue, about ten feet above the water's edge, a seam of bituminous shale occurs, which has given rise here and elsewhere to a great deal of exploration and much useless expenditure. It is from three to four feet in thickness, and contains about three inches of coal. Lower down, below the level of low water, another seam of bituminous shale is found, which has also caused much disappointment. A shaft was sunk to it a few miles above Council Bluffs, on the opposite side of the river.

It will thus be seen that the Carboniferous rocks extend for ten or twelve miles, and possibly further, north of Omaha, at which point they are about six miles wide; and that on the north bank of the Platte they extend west for about fifteen miles, while on the south bank they can be reached for about twenty-five miles. They form the extreme northwest boundary of the great coal-field which embraces parts of Iowa, Missouri, and Illinois.

The thin seams of coal which crop out at or near the water's edge have given rise to much exploration, most of which was not only unprofitable, but of such a nature that nothing was to be gained by it. The citizens of Bellevue directed a boring to be made in a ravine near the town; they, however, stopped at 100 feet, and decided to go no further. No record was kept of the boring, but from the men who made it we learn that at thirty feet, as near as they could recollect, they struck a six-inch seam of coal. This is probably the bituminous shale to which the shaft north of Council Bluffs was sunk. At ninety feet they struck another seam which was two feet thick.

A seam of coal crops out on Nodoway Creek, about forty-five miles east of Bellevue, in Iowa, which varies from eighteen to

twenty-five inches in thickness. This coal is worked to a small extent and brought into Council Bluffs and Omaha. It is possible that this is the seam reached in the boring at Bellevue.

At Des Moines, 175 miles east of Omaha, in Iowa, a bed of coal six feet in thickness is said to have been struck at about 200 feet. If this is true, and the dip of the strata is constant, it would bring this bed at 550 feet from the surface at Omaha. According to the section given of the Missouri coal-fields by Mr. Hawn, in the Geological Report of Missouri, a bed of coal six feet in thickness should be found 600 feet from the water's edge at Bellevue.

It is impossible, in the limited time that could be devoted to this subject, and without a more intimate acquaintance with the section of the Iowa coal-fields, to give any other than a conjectural opinion with regard to the depth at which a workable bed of coal will be found.

Prof. Swallow estimates the whole thickness of the Missouri coal-field at 650 feet; Mr. Hawn estimates it at 739. It is possible that it may be thicker in Nebraska, but admitting that the thickness is 1000 feet, there is still a prospect of a workable bed of coal being found within working distance of the surface.

There are two ways to settle this question. One is to explore the country in Iowa which has never yet been surveyed. This survey should extend to Des Moines. The second, and the most satisfactory, will be to make an artesian boring. This can be done on the shore of the Missouri at Bellevue, or on the bottoms at Omaha, which are only a few feet above Bellevue. Bellevue is however preferable, because the boring will commence in rock, while at Omaha a number of feet through the quicksands will have to be tubed.

This boring should be at least 700 feet in depth. If the coal is not reached at that depth, it should be pushed to 1000, to settle the question.

If coal is found below 600 feet, it will become a question of calculation whether it would be better to purchase land in Iowa, where the coal is nearer the surface, and transport it by rail, rather than work it at such a depth.

If such a boring is made, it will be very necessary that the results should be carefully recorded from day to day; and that, as far as practicable, specimens of the rock should be kept for inspection and examination.

## CRETACEOUS PERIOD.

The limestones of the upper Coal Measures are covered with a red siliceous sandrock. It appears perfectly developed at Sauntee, in the bluffs of the Platte. It is also seen on the Elkhorn, near Iron Bluff, and on the Papillon, the exposures varying from 20 to 40 feet in thickness. It is quite unusual to be able to see its actual contact with the limestone without considerable exploration. The only place observed where they came together near the surface is on Pawnee Creek, a few miles east of Salt Creek. A few feet of earth removed here would show the junction of the two, but the work even here would have been so considerable that it was not undertaken.

The red sandstone which crops out in the hill is of rather coarse grain; and where the soil has been washed out, it is usual to find large slabs of this rock, and of the limestone below it, turned vertically on their edges. The top rock of the Carboniferous is a light yellow limestone, filled with the debris of a large number of fossils, including many Encrinite stems. It is much sought for in the vicinity of Salt Creek for building. The stone is quite soft, and is easily cut when first taken from the quarry, but grows harder after exposure to the air.

The shade of the sandstone varies, and the rock is not constant in character. It is sometimes fine and friable, sometimes quite compact and hard; sometimes it is loose sand or gravel, and at others a conglomerate, closely cemented with iron, and containing large pieces of a siliceous oxide of iron. It is generally, however, so loosely cemented that it may be rubbed to pieces in the hand. Very little of it is suitable for building purposes.

The coloring and cementing material of this rock is oxide of iron, which frequently becomes concentrated, so as to give the rock an appearance of stratification. Wherever this concentration occurs geodes of oxide of iron, of all sizes, are found. These geodes are usually filled with yellow sand. One of them was observed five feet long and four wide, resting on the top of a cone fifteen or twenty feet in height. It had been much larger than this; pieces recently broken off had fallen down at its side, and were scattered all along the slope of the hill. Sometimes, instead of forming geodes, the iron appears to enter into combination with the silica; it then forms an exceedingly

hard rock. This variety has been quarried to some extent at Iron Bluffs for building purposes. Quarries in this rock are not, however, to be depended upon.

The geodes of iron do not occur in sufficient quantities to be used as an ore; besides which, the greater part of them are too poor and too refractory to be used in a country where fuel is so scarce.

At Sauntee the rock is so soft that it has been excavated to a considerable extent by the Indians. Fifteen or twenty feet of the excavation were formerly covered with Indian hieroglyphics. These have been effaced to a very large extent by the inelegant carvings of recent visitors, who have generally taken care to leave their names and the dates of their vandalism behind them.

North of here and higher in the series, the rock frequently loses the red tinge, becomes a light grey, and is filled with small particles of mica and pyrites. This rock is full of dicotyledonous leaves. The stems of many of the plants are still preserved, and lie loose in the cavities which contain them. This rock was observed only once, in an excavation on Logan Creek, a branch of the Elkhorn river. It had been thrown out from a shaft sunk on a thin bed of lignite. The rock appears to contain quite a number of thin seams of lignite. None of them, however, which have yet been discovered, will pay for working.

Owing to the friable nature of the rock, and the very extensive action of the drift, it does not often crop out in the prairies, except near some stream. Its limits are Salt Creek, Buffalo Creek near its mouth, and the banks of the Papillon. The next indication of it is at Tekama, from which place specimens were sent to the headquarters of the survey at Omaha. It is possible that it crosses the Missouri River south of this place, but no traces of it were observed as far north as De Soto.

The red sandstone is overlaid by a greyish marl, which appears in the beds of the streams west of De Soto and again at Logan Creek, where it was struck in the shaft sunk on the thin lignite seam. No fossils were seen in it, and but for the fact that it appears to contain several thin seams of lignite it would have been impossible to distinguish it from the ordinary clays found everywhere associated with the drift. This clay contains limestone concretions, which are sometimes of sufficient size to be burnt for lime. The

surface does not of course give any indications of the presence of this clay. It is only seen in the bottoms of the streams whose banks are at least fifteen or twenty feet high, and in one or two shafts sunk for coal. The seams of lignite can generally be traced by the presence of the hydrated sesquioxide of iron in the banks of the streams. The thickest of these lignite seams does not exceed six inches. It is said, however, that on the northern boundary of the Territory they are sometimes found of sufficient thickness to work.

West of Logan Creek no rock appears in place on the north bank of the Platte until we reach the Pawnee Reserve.

On the south bank, however, at Skull Creek, we find a grey marl associated with a white limestone. These crop out in the bed of the stream near its mouth, where a thin bed of bituminous shale is found, which has given rise to some exploration and disappointment. The white limestone contains a number of fossils. A cast of *Ammonites percarinatus*, what appeared to be a *Baculite*, and *Inoceramus problematicus*, were found. The latter fossil is so abundant that it is almost impossible to break a piece of the rock without finding two or three very perfect impressions of it. The stream runs over the outcrops of these rocks for some distance, and the banks are cut down through the marl and limestone to the depth of fifteen feet.

These marls are greyish and laminated when first taken out, but on exposure to the sun they grow whiter, and assume nearly the hardness and consistency of chalk, and are used as such by the settlers.

West of Skull Creek no outcrops of rock were seen, and none had been reached by the wells of which information could be gained. In Beaver Creek, on the Pawnee Reserve, a blue marl, containing *Ostrea congesta*, is found in the bed of the stream. This marl is of different texture from that of Skull Creek, and is found much higher in the series. It grows hard on exposure, but not sufficiently to be used for building. The specimen examined was obtained from the bed of the creek by an Indian, who dove for it.

## DRIFT

All of these rocks, where they are seen on the outcrops in the bluffs, are covered with a stratum of clay overlaid with gravel.

Where the rocks are compact, as is the case with some of the sandstones of the Cretaceous and the limestones of the Carboniferous, the line of demarcation between the two is perfect. Elsewhere, it is somewhat confused. The clay varies in depth and is generally of a bluish color. The gravel is made up of every variety of material. Generally it shows no sign of stratification. Occasionally, however, it presents a stratified appearance, and shows the very changeable nature of the current which deposited it. This disposition is not continuous, being shown only occasionally, and then over a very small area. It can be seen in the strippings of earth made to get at the rock below.

When the rocks are hard, the surface in immediate contact with the gravel is polished and striated. The striæ run S. 8° E. They were traced over the lime-rocks from Omaha to Plattsmouth, and there is little doubt that they will be found wherever the rock has been strong enough to resist disintegration.

The lower part of the gravel is made up of coarse material of variable size. Pieces of argillaceous iron ore, evidently from the destruction of the Cretaceous sandstone higher up the river, were found, with other boulders several cubic inches in size.

The coarse gravel gradually passes into a fine sand, which is almost pure quartz.

This drift is not unfrequently ten to fifteen feet in thickness, and is composed of materials of every possible description. As we should expect from the direction of the striæ, it is composed of the metamorphic and sedimentary rocks which are found further north. No fossils were seen, except on Skull Creek, where a boulder of limestone was found containing a Silurian fossil.

Most of the sedimentary rocks which occur further north are too friable to withstand attrition, and for that reason are rarely represented in the drift. Occasionally, large rounded pieces of iron ore are found, several cubic inches in size. All the materials which compose this drift are water-worn and well rounded.

As we go west from the Missouri, as on the banks of the Elkhorn, we find this drift composed almost exclusively of quartz. Its thickness can rarely be measured, except in the bluffs. It is seen, however, very frequently in the wells dug by the farmers, showing its distribution over a large area.

As it overlies all of the rocks of the country it frequently forms a talus over them, where they would otherwise outcrop, thus concealing them from view.

## BLUFF FORMATION.

The gravel is everywhere overlaid by the yellow siliceous marl of the bluffs. As we approach Omaha from the Missouri bottoms, this bluff formation is the most noticeable feature of the scenery. It usually forms the third terrace from the stream, separating the bottoms from the high rolling prairie. These bluffs stand almost vertical, and at Omaha are nearly sixty feet high. In some places they are much higher. They are composed of a yellow siliceous marl, which contains pieces of chalk, calcareous nodules, usually not larger than two or three inches in diameter, and some terrestrial and fluviatile shells. When this marl falls, it breaks off in vertical columns, and forms a talus of no great height at a very steep angle.

The soil rests upon this marl, and not unfrequently the waters which filter through, absorb sufficient lime in their passage to cement the gravel beneath, giving it the appearance of a rock in place. In some places, as at Lime Kiln Hollow, in Iowa, this process has gone on to such an extent as to form a complete conglomerate. Lying between the marl and the limestone, it forms a terrace of its own, from which large slabs of conglomerate frequently slide down to the bottoms. These terraces can always be recognized at a distance by the very yellow color of the grass. They occur rarely, having only been noticed where the drift was high in the bluffs on the Iowa side.

This phenomenon is also observable on a large scale a few miles above Florence, in the bluffs. A large stream issues near their base over the conglomerate thus cemented, while the gravel is found in place on either side, only a short distance from them. North of Council Bluffs, on the opposite side of the river, in a similar situation, this action has taken place to such an extent as not only to cement the rock, but also to form a considerable deposit of tufa over it. Where the rocks come near the surface, the cracks which they contain are filled with concretionary lime deposits, and when the outcrop is buried in the soil, it is frequently covered with concretionary white limestone.

The yellow marl underlies the whole of the rolling prairie further west, and in the hills is often found to a very great depth. The water of the wells is usually found on reaching the gravel beneath it, and is, consequently, all hard.

The marl is seen in all the cuttings of the Railroad, where it shows its peculiar character, refusing to take a talus, and falling off vertically. After passing the Elkhorn, it begins to thin, and at Shins Ferry, fifteen miles east of Columbus, it is not more than five feet thick in the high bottoms on the south bank. It does not, however, within the first hundred miles grow so thin as to lose its effect on the vegetation of the country, rendering it everywhere luxurious. Wherever on the river-front it comes near the surface, "oak openings" are found. In a few places on the Platte bottom the soil is sandy, owing to the fact that the river has several times changed its channel, leaving sand ridges behind it. These ridges are not entirely sterile, since the Platte sand is mixed with some loam; but in comparison with the rich bottoms, they appear poor. They are, however, susceptible of cultivation. For such places the marl would be an excellent dressing. In some places where the wind has acted upon these sands, it has sifted out the loam, and the residue is almost pure quartz sand.

This siliceous marl of the bluff formation is seen in its greatest development on the banks of the Missouri near De Soto, at Rockport, about ten miles north of Omaha, and on the Elkhorn near Iron Bluff.

At De Soto it is not less than 100 feet thick, standing vertical in the Bluffs; at Rockport it has about the same thickness, resting on gravel, which, near springs, is cemented into conglomerate.

In most places it contains a large number of shells, among which the species *Helix*, *Planorbis*, and *Physa* were recognized.

The marl is everywhere filled with calcareous concretions which are usually hollow, and it is penetrated in every direction to a considerable depth by round holes, formed by the decay of the roots of trees. The gophers and ground-squirrels are always busy making their holes, and these passages form together a system of natural drainage, which in the low lands prevents too great an accumulation of water, and at the same time does not afford a sufficiently easy flow to cause the higher lands to lose their moisture too quickly.

## SOIL.

The vegetable mould rests directly upon the yellow marl. It has a brownish-black color, and when dry breaks up into angular fragments, and crumbles easily when pressed between the fingers. When wet it is tough; a few moments' rain is sufficient to make the roads very heavy. Half a day of wind or sun will, however, dry them. When the weather has been dry for a long time, the tires polish their tracks, and the roads become nearly as hard as if they were macadamized. Dust does not usually collect so as to make the roads heavy. It is generally blown off by the wind, and it requires long-continued dry weather to cause it to accumulate.

This soil has evidently been formed by the growth and decay of plants on the spot, aided for a long series of years by the accumulation of the ashes of the plants which have been burned, and the gradual admixture of the marl with them. It is generally free from sand except in isolated spots in the bottoms of the rivers. Clay is rarely found within the first 100 miles, except near the banks or in the beds of a few streams, or where the clays of the Cretaceous period come to the surface.

A characteristic of this soil, underlaid as it everywhere is by the siliceous marl, is, that it is able to withstand long-continued drought as well as frequent heavy rains. The farmer is rarely disappointed in obtaining a fair average crop, while with moderate care, in ordinary years, the harvest is abundant.

The native prairie grasses grow luxuriantly in most places, and are found well adapted to raising stock of all kinds, which fatten upon them as well as upon the cultivated grasses of the Eastern States. When the native grasses disappear, either from cultivation or too much grazing, they are easily replaced by the cultivated grasses, which thrive here as well as in the East.

The effect of the geology of the country upon the soil is not so apparent here as it is in the northwestern part of the Territory, where the Cretaceous and Tertiary rocks come to and compose the surface, and have gained for that part of Nebraska and Dacotah the name of Bad Lands.

The influence of the Carboniferous rocks is seen mainly in the character of the wash of the rivers. The rocks crop out in a very few places, and then only in the bluff, where they are covered to

a considerable depth by the drift and marl. Where the banks of the rivers are formed by the rocks, the limestones are carried only a short distance from their outcrops, and are either buried in the talus or in the bottoms. The clays and softer slates are washed out with the detritus of the lime-rocks, and go to make the soil of the bottoms.

The same is true of the rocks of the Cretaceous formation, but these, from their much more friable nature, are more likely to extend their influence further, rendering the soil sandy, or stiff and clayey, according as one or another of the rocks comes near the surface. Neither of these influences predominates within the limits of this survey to such an extent as to interfere with the fertility of the soil. Such soils rarely extend beyond the limits of the talus of the hills, and they can always be rendered fertile by means of the sub-soil plough.

The soil varies somewhat with its position relative to the river-beds. In the bottoms it is entirely alluvial, and is composed of the wash of all the geological formations above, as well as of the alluvium of the rivers themselves, which contains a large admixture of lime and loam. When these bottoms are sufficiently above the first terrace to be beyond the danger of overflow in the spring freshets, they are cultivated, and yield a very abundant crop. On the Missouri, when they are below this level, and are subject to the overflow, they are generally covered with a dense growth of cotton-wood. The size of these trees depends on the fickle nature of the current. Sometimes they grow to be three and four feet in diameter; and at others, they are washed out in the first or second year of their growth. The bottoms of the streams west of the Missouri, being less subjected to overflow, have much less timber—which is more frequently oak, elm, and other hard woods—than on the Missouri bottoms.

The separation between the second and third river-terrace on the Missouri, is usually an escarpment from sixty to one hundred feet high, of the yellow, siliceous marl. It is this bluff which is cut down to furnish the material for making bricks. At Omaha, and elsewhere, this bluff rises vertically. Council Bluffs is 45 feet above the river; and the rise is so gradual that the line between the bottoms and the third terrace is scarcely perceptible.

The soil on the third terrace is made up of vegetable mould.

The same is true of the valleys in the rolls of the prairie. The rain washes it off from the surface, and collects the ashes of the plants and the black soil. In such situations, it is not unusual to find this loam from twenty to thirty feet thick, and even thicker. It is rarely less than two or three feet in thickness. As it is always underlaid by the marl, it is more or less calcareous, and in the best possible condition to yield an abundant harvest.

As we rise to the fourth and highest terrace, which forms the actual divide of the waters, we find the black soil growing thinner from the constant wash, and the marl approaching nearer the surface. In very many places, the surface of this terrace is covered with siliceous and other pebbles, and occasionally with small boulders of granite. These pebbles do not appear to extend to any depth in the soil. They are not usually seen in the earth thrown out by gophers in digging their holes.

Between the bottoms on this terrace, the country is formed of rolling prairie, which is almost destitute of timber; occasionally, a clump of trees is found near the banks of some stream, or around some slough, but there is never enough for agricultural purposes. The soil is, however, fertile, and is covered with a luxuriant growth of grass. This ground is admirably adapted for raising stock of all kinds. Springs are not found as frequently as on the bottoms, but they are found occasionally, and their scarcity is not felt, from the general abundance of sloughs. Water is usually reached at a depth of from thirty to sixty feet, in the valleys.

It will be seen that the soils are of two general characters; the alluvial, which forms the bottoms of all the rivers; and the bluff, which is characteristic of all the rolling prairie.

The alluvial soil is always rich. It is porous, slightly calcareous, and siliceous at the same time. It bears by far the greater portion of the timber of the Territory, in which the cotton-wood largely predominates. It is usually so near the level of the rivers as not to suffer from drought until some time after the stream itself is dry. It always produces a luxuriant growth of grasses and corn. In many places wild hemp grows, to the exclusion of the grasses. Such spots as these furnish protection to the seeds of trees, and are often covered, after a short time, by groves of trees. Where these bottoms are subject to overflow, they are sometimes sandy; but generally the soil is enriched by the top-dressing deposited upon it.

The bluff soil is that formed upon and partly made up of the yellow marl of the bluffs. The mineral constituents of this soil are such, and in such physical condition, as to adapt it admirably for agricultural purposes. Wherever this soil exists to its fullest extent the lands are rich, but not so rich as the bottoms. The vegetable mould is never so deep, and it is consequently better adapted to sustain long-continued drought. The farmers were at loss to explain why it was that crops on their high lands were less affected by drought than those on the low. This is easily explained, both by the easy drainage of the bottom-lands, from the porous nature of the soil, and their proximity to the borders of the streams, as well as by the nature of the bluff-soil, which loses its water much less easily.

Corn, wheat, and oats grow luxuriantly upon this soil. Where the current of a stream strikes the bluffs and causes a movement in them, wild hemp and native grape-vines spring up in profusion. On some of the small streams the hemp and grape-vine together make a thicket which it is difficult to penetrate. When this soil is broken up by the plough, in the Autumn, to the depth of two or three inches, it will be in excellent condition for cultivation in the Spring, and it yields very large crops, sometimes even larger than the apparently richer bottom-lands. Ground which has been broken in the Spring even, produces a fair crop. This soil has been enriched every year for centuries by the burning or decay of the grass, and as little or nothing of the mineral element is ever taken away, the ground grows richer every year.

Care must, however, be taken with it in ploughing, for as there are no trees to arrest the rain, the ploughed ground is subject to wash. Attention must be paid to this fact by the farmer in selecting his ground for planting.

In the high rolling prairie, and along the backbone, this soil has been subject to wash for a long period, which has left it poorer and more sandy than the other soils. The surface is strewn with various kinds of pebbles. It is on this soil that the wind and storms produce the little terraces which give a very peculiar character to the landscape. The gophers and ground-squirrels, however, have shown that this land is in no sense sterile, for wherever they have thrown up the dirt from their holes the grasses show the benefit of subsoil cultivation. A subsoil plough and a little manure will make such land quite as productive as other soils; and while

the farmer who has a better ground may feel himself justified in neglecting it, a little care bestowed here will in many cases be more than an equivalent for the extra fertility of the richer soil.

## BOULDERS.

West of the Elkhorn erratic boulders of red quartz and granite begin to appear in the hills. They are usually found on the sides of the rolls of the prairie. These boulders are rarely larger than from one to four cubic feet, and are well worn on the edges. Smaller pieces of chlorite slate and diorite are occasionally found with them. The hills upon which these boulders of quartz and granite are found are usually covered with small and much-worn pieces of chalcedony jasper and wood-opal, and occasionally pebbles of limestone. Only one piece was found large enough to contain a fossil, which was *Strophomyna alternata*, showing the rock to be Silurian. All these rocks are found in abundance further north, in Dacotah, Iowa, and Minnesota.

## FORMATION OF THE ROLLING PRAIRIE.

It is more than probable that the whole of the rolling prairie of this country was originally level. The older streams, like the Platte, the Elkhorn, the Loup Fork, the Papillon and Shell Creek, appear to have given the first general outline to the topography of the country. These are confined within broad bottoms, and change their channel. Smaller streams are, however, constantly forming, and the minor topography is everywhere being changed by the wash of the Spring rains, or other causes. It is not an unfrequent thing, while riding along the bottom, between two rolls of the high prairie, to find that it suddenly descends almost vertically from five to ten feet, giving unmistakable evidence of a recent freshet.

If any doubt, however, should exist in regard to it, the formation of the rolling prairie can be seen actually going on at De Soto. Just above the town, in the bluffs, many earth-cañons are being formed at the present time. There are quite a number of them parallel to one another, and nearly at right angles to the Missouri River. Two of them were traced from their origin, which were over a quarter of a mile in length. They have once cut off the road leading north along the bluffs, and are now rapidly encroaching on it again.

These cañons vary from sixty to eighty feet in height, and are from fifty to two hundred feet broad. Their walls are vertical, and when they fall, either by becoming detached from the bank and falling over, or by being washed out from underneath and settling down, they leave a vertical face.

The cañon commences generally in a hole made by a snake or a gopher, or in a crack made by the frost. When any part falls it does not crumble entirely, as we might expect, but carries down with it large trees, which continue to grow erect. This settling appears to take place gradually, and its effects can be seen from the bottom to the top, in terraces in all stages of descent. As the valley widens the water has less scope for energetic action. The action of the waters on the sides of the cañon begins to round off the banks and to form depressions which gradually become deeper, until we have the whole series of subordinate valleys, both on a large and a small scale.

The same phenomenon can be seen on a much smaller scale at Salt Creek, where an earth-cañon recently formed has advanced through the bluff into the road south of the town.

It can also be seen in the high bluffs about a mile north of Council Bluffs on the Missouri.

The deepening of the valleys between the rolls of the prairie is accompanied also by the destruction of the crest of the hill where the incline becomes steep.

In the valleys which run in the direction of the prevailing wind, earth-terraces about six inches high are formed by the action of the storms, which facilitates the erosive action of the water.

## CLIMATE.

The limits of the survey are comprised between 40° 40′ and 41° 50′. Within these limits very few meteorological observations have been made, except by the observers of the Smithsonian Institution of Washington, D. C. It is to them that we are indebted for all the accurate records that have been made of the climate of the Territory. The following tables have been compiled from the published documents of this Institution. Table No. 1 contains the observations taken at Bellevue and Elkhorn City for the years 1863 and 1864. Table No. 2 gives the mean temperature for every month, season, and year, from 1858 to

1864. Table No. 3 shows the amount of rain, in inches, which has fallen, and the average for each season and year. Table 4 gives the observations for temperature at the same parallel further East. These observations have been made for too short a period, and over too limited an extent of territory, to admit of drawing anything more than very general conclusions. Blanks in the columns signify that no observations have been recorded. The temperature is indicated in degrees of Fahrenheit's thermometer. A dash (—) signifies degrees below zero.

TABLE, No. 1.

## ELKHORN CITY.

### 1863.

| | *Jan.* | *Feb.* | *Mar.* | *Apl.* | *May* | *June* | *July* | *Aug.* | *Sept.* | *Oct.* | *Nov.* | *Dec.* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date, | 2 | 27 | 21 | 17 | 19, 20 | 27 | 9, 10 | *16 | | *16 | *6, 18 | *3, 22 |
| Maximum Temperature, | 51 | 46 | 68 | 88 | 86 | 96 | 96 | 96 | | 70 | 60 | 41 |
| Date, | 16 | 2 | 4 | 3 | 5 | 21 | 16 | 29 | | 28 | 28 | 31 |
| Minimum Temperature, | — 9 | — 6 | 3 | 27 | 45 | 52 | 56 | 35 | | 4 | — 15 | — 28 |
| Mean Temperature, | 28.6 | 23.5 | 3.52 | 53.8 | 63.8 | 67.89 | 72.6 | 72.5 | | 36.6 | 32.9 | 18.4 |
| Rain and Melted Snow, | | 0.90 | | | | | | 2.70 | | 0.50 | 2.35 | 2.90 |

### 1864.

| | *Jan.* | *Feb.* | *Mar* | *Apl.* | *May* | *June* | *July* | *Aug.* | *Sept.* | *Oct.* | *Nov.* | *Dec.* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date, | 26, 27 | 22 | 3 | 25 | 29 | 21 | 18 | 24 | 2 | 13 | 5 | |
| Maximum Temperature, | 49 | 65 | 67 | 79 | 94 | 101 | 100 | 99 | 99 | 70 | 56 | |
| Date, | 7 | 17 | 20 | 5 | 10 | 6 | 2 | 17, 18 | 24 | 18, 28 | 22 | |
| Minimum Temperature, | — 22 | — 3 | 6 | 28 | 33 | 50 | 60 | 57 | 32 | 26 | 1 | |
| Mean Temperature, | 16.1 | 30.8 | 33. | 46.3 | 63.6 | 74.9 | 77.1 | 74. | 66.4 | 44.8 | 33.1 | |
| Rain and Melted Snow, | | | | | | | | | | | | |

* These observations were taken at Fontenelle.

## BELLEVUE

### 1863.

| | *Jan.* | *Feb.* | *Mar.* | *Apl.* | *May* | *June* | *July* | *Aug.* | *Sept.* | *Oct.* | *Nov.* | *Dec.* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date, | 4 | 18 | 21 | 17 | 15 | 27 | 30 | | 14 | 6, 11 | 6, 18 | 3 |
| Maximum Temperature, | 59 | 50 | 70 | 80 | 87 | 90 | 86 | | 93 | 70 | 60 | 6 |
| Date, | 16 | 1, 2 | 4 | 3 | 6, 23 | 20 | 13 | | 18 | 31 | 28 | 315 |
| Minimum Temperature, | — 6 | 2 | 7 | 31 | 40 | 48 | 54 | | 37 | 14 | — 3 | — 20 |
| Mean Temperature, | 31. | 26.3 | 37. | 52.3 | 63. | 67.50 | 71. | | 65. | 42.5 | 35.7 | 25.4 |
| Rain and Melted Snow, | 0.75 | 0.56, | 0.50 | 0.75 | 3.88 | 2.84 | 2.25 | | 1.75 | 1.00 | 1.65 | 3.85 |

### 1864.

| | *Jan.* | *Feb.* | *Mar.* | *Apl.* | *May* | *June* | *July* | *Aug.* | *Sept.* | *Oct.* | *Nov.* | *Dec.* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date, | 27 | 22 | 3 | 25 | 29 | 20 | 17, 18 | 24 | 2 | 1 | 5, 6 | 1 |
| Maximum Temperature, | 53 | 66 | 65 | 78 | 88 | 95 | 93 | 91 | 99 | 71 | 56 | 50 |
| Date, | 1 | 16, 17 | 20 | 2 | 11 | 1, 6 | 2 | 18 | 24, 30 | 28, 29 | 22 | 8 |
| Minimum Temperature, | — 17 | — 2 | 7 | 28 | 32 | 53 | 60 | 58 | 40 | 28 | 3 | — 14 |
| Mean Temperature, | 18.7 | 31.6 | 35. | 45.2 | 60.6 | 73.7 | 77.9 | 75.2 | 67.4 | 46.6 | 34.3 | 19.9 |
| Rain and Melted Snow, | 0.41 | | | 2.40 | 1.32 | 2.86 | 0.74 | 1.48 | 1.77 | 4.23 | 1.45 | 0.34 |

## TABLE, No. 2.

| | *Average* 1858. | *Average* 1859. | *Average for Six Years.* | *Average* 1863. | *Average* 1864. |
|---|---|---|---|---|---|
| December, | 22.0 | 20.1 | 22.6 | 20.1 | 21.9 |
| January, | 32.9 | 22.4 | 21.8 | 29.8 | 17.4 |
| February, | 17.3 | 23.8 | 22.6 | 24.9 | 31.2 |
| Winter average, | 24.0 | 22.1 | 22.3 | 24.9 | 23.5 |
| March, | 44.7 | 39.8 | 40.2 | 36.1 | 34.0 |
| April, | 48.2 | 41.4 | 48.0 | 53.1 | 45.8 |
| May, | 53.1 | 64.6 | 58.7 | 63.4 | 63.6 |
| Spring average, | 48.6 | 48.6 | 48.9 | 50.8 | 47.8 |
| June, | 74.5 | 71.0 | 70 | 67.7 | 74.3 |
| July, | 76.8 | 77.7 | 77.1 | 71.8 | 77.5 |
| August, | 73.6 | 73.8 | 73.7 | 72.5 | 74.6 |
| Summer average, | 74.9 | 74.1 | 73.6 | 70.6 | 75.4 |
| September, | 64.9 | 63.0 | 67.7 | 66.5 | 66.9 |
| October, | 51.9 | 51.6 | 54.1 | 39.6 | 45.7 |
| November, | 31.0 | 37.3 | 33.4 | 39.3 | 33.7 |
| Fall average, | 52.6 | 50.6 | 51.7 | 48.1 | 48.7 |
| Mean Temperature, | 50.0 | 48.8 | 49.1 | 48.6 | 48.8 |

## TABLE, No. 3.

| | 1858. | 1859. | *Min. of Six Years.* | 1863. | 1864. |
|---|---|---|---|---|---|
| December, 1857, | 0.80 | 0.90 | 0.70 | 0.70 | 3.40 |
| January, | 1.82 | 0.94 | 1.38 | 0.75 | 0.41 |
| March, | 0.80 | 0.68 | 0.74 | 0.73 | |
| Winter Total, | 3.42 | 2.52 | 2.82 | 2.18 | 3.81 |
| Winter Average, | 1.14 | 0.84 | 0.94 | 0.72 | 1.90 |
| March, | 1.50 | 1.73 | 1.76 | 0.50 | |
| April, | 5.05 | 1.64 | 3 44 | 0.75 | 2.40 |
| May, | 4.40 | 5.60 | 5.00 | | |
| Spring Total, | 11.25 | 8.97 | 9.20 | 1.25 | 2.40 |
| Spring Average, | 3.75 | 2.99 | 3.06 | 0.41 | 2.40 |
| June, | 7.10 | 2.80 | 4.30 | 2.80 | 2.86 |
| July, | 15.80 | 1.80 | 6.40 | 2.25 | 0.74 |
| August, | 1.90 | 1.80 | 4.40 | 2.70 | 1.48 |
| Summer Total, | 24.80 | 6.40 | 15.10 | 7.75 | 5.08 |
| Summer Average, | 8.26 | 2.13 | 5.03 | 2.58 | 1.69 |
| September, | 2.60 | 2 10 | 2 40 | 1 75 | 1 77 |
| October, | 6.00 | 1 30 | 3 70 | 0 75 | 4 23 |
| November, | 0.60 | 1 20 | 1 20 | 2 00 | 1 45 |
| Fall Total, | 9.20 | 4 60 | 7 30 | 4 50 | 7 45 |
| Fall Average, | 3 06 | 1 53 | 2 43 | 1 50 | 2 48 |
| Yearly Total, | 48 67 | 22 49 | 34 42 | 15 68 | 18 74 |
| Monthly Average, | 4 05 | 1 87 | 2 87 | 1 30 | 1 56 |

TABLE, No. 4.

| | N. Lat. | Winter. | Spring. | Summer. | Fall. | Year. |
|---|---|---|---|---|---|---|
| Burlington, N. J., | 40. | 32.10 | 46.35 | 70.55 | 50.58 | 50. |
| Harrisburg, Pa., | 40.16 | 32.76 | 48.79 | 74.4 | 55.75 | 52. |
| Augusta, Ill., | 40.12 | 26.86 | 43.18 | 72.05 | 50.21 | 43. |
| Newark, N. J., | 40.45 | 26.71 | 45.48 | 69.00 | 52.70 | 48. |
| Easton, Pa., | 40.43 | 28.45 | 45.08 | 68.66 | 50.13 | 48. |
| Logansport, Ind., | 40.45 | 26.00 | 42.66 | 70.00 | 51.00 | 48. |
| Madison, Ohio, | 41.52 | 28.89 | 42.89 | 67.32 | 48.99 | 47. |
| New London, Conn., | 41.32 | 26.18 | 43.33 | 67.16 | 52.66 | 48. |
| West Point, N. Y., | 41.23 | 29.7 | 48.7 | 71.3 | 53.2 | 50. |
| Muscatine, Iowa, | 41.25 | 22. | 46.40 | 70.44 | 49.14 | 47. |
| Council Bluffs, | 41.15 | 21.7 | 49.3 | 74.7 | 51.4 | 49. |

These tables show the Spring and Summer to be warmer, and the Winter colder, in Nebraska than on the same parallel further east. This is easily accounted for by the absence of trees. There is no protection from the Summer sun, and the Winter winds have nothing to break their force.

The distribution of rain shows an average for ten years of 28 inches. The minimum was 15.68 in 1863, and the maximum was 48.67 in 1858. The amount is not quite equal to the average in Iowa. It is a well-known fact, however, that the amount of rain diminishes as we go west of the Mississippi. It will be seen that the greatest amount falls in the Summer and Spring, and the least in the winter.

The Winters are sometimes severely cold, the thermometer sinking at times several degrees below zero. The extreme cold does not continue for more than a few days. The mean temperature is not very low. The cold is, however, felt more keenly on account of the winds. Stock requires more protection, during most Winters, than in other climates of the same average temperature, but can sometimes be allowed to run at large, in places protected by trees, during the whole Winter.

The prevailing winds are from the S. E., S. W. and N. W. The storms usually come from the S. E. During the Summer, the sand upon the river-bottoms becomes dry. The prevailing summer winds are from the S. W., and frequently carry it a little distance from the river and form slight sand-ridges running N. W. and S. E. This sand is frequently found on the line of the Railroad, and is composed almost entirely of quartz, all the lighter materials having been separated from it.

## MISSOURI VALLEY.

The eastern part of this survey embraces a narrow strip of land in the Missouri Valley. The river runs very near the

bluff on its western side, so that the bottom is narrow. Its position changes a little every year. Sandbars and islands are constantly forming or being washed out, so that land near the river is held by a very uncertain tenure. A single freshet often carries away a large number of acres of woodland, without leaving a landmark behind. Land is continually forming too, and proprietors who have the river for one of their boundaries often find that one acre has been increased to ten. Such land, being liable to the wash of the rivers, is rarely cultivated, and is left to the spontaneous growth of trees, which furnish the larger portion of the fire-wood of the eastern counties. Another large portion of this wood is drift, which is stranded on the islands in the river, and drawn away during the Winter over the ice.

The sand of the river-banks mixes easily with water, and forms quicksand. On the banks proper, above the water, this sand is firm. At the water's edge, it appears to be so. If, however, a slight movement is made from side to side by throwing the weight of the body first on one foot and then on the other, the sand soon separates into strata, with water between, which make long, low undulations, and in a few moments more become quicksand. When the undulations commence, a stick can be pushed down to almost any depth, by the slight pressure of the hand. A few inches above the level of the water, it is perfectly dry and hard.

The bluffs of the river produce a large quantity of oak and other hard woods. In the vicinity of Omaha, and as high up as Rockport, the most of this wood has been or is now being cut off.

The soil is composed of black loam, and the surface above the bottoms and beyond the terraces is rolling prairie.

Water is everywhere reached in the wells at from 30 to 60 feet, according to the situation.

## PLATTE VALLEY.

The width of the Platte bottoms is about three miles. They are exceedingly fertile, and are covered with a luxuriant growth of grass. As the river rarely if ever overflows its banks, they are well adapted for all agricultural purposes, and amply repay the least cultivation. For the first fifteen or twenty miles of its course, as we go west, rocks crop out in the bluffs, and furnish a good quality of building-stone. Red and yellow ochre are found on Paw-

nee Creek, and will probably answer for paints. Springs are frequently found issuing between the layers of the rocks. Sloughs of all sizes abound, which are frequently quite deep, and water can be reached very generally at the depth of from ten to twenty feet.

Near its mouth the bottoms are covered with cotton-wood, and the bluff with "oak openings;" but as we go west, the oak disappears, and the cotton-wood is the only tree, and is confined to the islands and to the banks of the stream. These oak groves are sometimes very extensive, as between Skull and Salt Creeks, on the south side of the Platte, and near Sauntee on the north side. Other timber, such as ash and elm, is sometimes mixed with the oak. Such groves of timber encroach very fast upon the prairie when the fires are kept out. Two or three places were seen where twenty or thirty acres had been overgrown with thick hard-wood brush, after keeping the fires out for three years. A little care in thinning out these trees would make the timber-lands valuable in a few years.

The land is rich, except where the river has changed its course, or the wind has thrown up sand-ridges. The surface is so near the level of the river that water easily filters through the porous soil. When the surface falls to the level of the river the ground is moist. When it falls a little below, so as to form marshes, muck swamps are formed, which in dry seasons sometimes take fire and burn. It is probable that such places will furnish a good quality of peat.

In some of the islands of the Platte which are overgrown with cedar-trees, stock can be left to run all Winter. Where the farmers have sheltered their farms with trees, they have found no difficulty in raising winter wheat, which has always yielded a very large crop. As we rise from the bottoms, we meet high rolling prairie, which is generally destitute of trees except on the banks of the small streams, where the timber is usually oak.

As we go west on the river, the soil becomes more and more sandy. At the mouth of the Loupe Fork, the soil is decidedly sandy, but not so much so as to interfere with its fertility. On the south side, above Fremont, there are very few trees. In many places the ground is covered with a tall bearded grass, which disappears when the ground is cultivated. The soil contains more clay than on the north side. A short blue grass grows abundantly, which is very nutritious, and is eagerly sought after by cattle,

and eaten off to the roots, in preference to the other grasses which grow with it. The general yield of the crops, to the acre, is corn, 30 to 60 bushels; wheat, 25 to 30 bushels; sorghum (syrup) 280 gallons. In extraordinary years, with good tillage, as much as 80 bushels of corn, 40 bushels of oats, and 400 gallons of sorghum have been produced. The wheat is spring wheat.

## PAPILLON VALLEY.

The valley of the Papillon does not differ from the valley of the Platte. The bottom is about one mile wide, and very fertile and well timbered. The character of the soil varies slightly with the rocks that outcrop, and this is more especially true of the red Cretaceous sandrock. Groves of hard timber are found occasionally, at some little distance from the streams. Peat-bogs have been found, but have not been worked. This valley is well settled, and the farms are in a higher state of cultivation here than anywhere except upon the Elkhorn. Large droves of stock of all kinds are herded on the rolling prairie.

## ELKHORN VALLEY.

The banks of the Elkhorn are usually low, and the bottoms, like those of the Platte, which this river resembles very much, are rich, and generally well timbered. Some of the cotton-wood trees are five feet in diameter. Elm, maple, oak, and ash grow in small quantities on its tributaries, but the chief timber of the bottoms is cotton-wood. The timber is not wholly confined to the river-bank, but groves are found round the banks of the sloughs, giving a very picturesque appearance to the landscape.

The second terrace is not very well defined; the first terrace usually extends to the bluffs. The third terrace is, however, well marked, and furnishes quite a large amount of level prairie. There is also a considerable amount of level ground near the mouths of all the tributaries of the Elkhorn.

This and the Papillon valley are the best cultivated of the region. The farmers have planted trees on a large scale, and are already reaping the advantages of it. The soil is very fertile. The average crops are: corn, 40 to 60 bushels; wheat, 12 to 18; sorghum, about 200 gallons.

Small seams of lignite crop out in the banks of the river. This lignite and the rocks associated with it are filled with pyrites, so as sometimes to render the water in the wells which reach it quite noxious and unfit for use. The water of ordinary wells, however, generally reached in a few feet from the surface, does not contain anything more than salts of lime.

## PEBBLE AND MAPLE VALLEYS.

The branches of the Elkhorn do not differ from it in their main features. The most prominent of them are Pebble and Maple Creeks. The banks of these streams are quite high, and they are subject to sudden rises and falls. The bottoms of Pebble Creek are about a mile wide. The soil is rich and easily worked. The blue grass, which is so eagerly sought for by stock, is frequently found, both on the bottoms and the high prairie. Near its junction with the Elkhorn the bottoms are well timbered; for the most part with oak and elm. Farther west, the timber decreases, especially as we reach the point where the streams are liable to run dry for a certain time during the year. There is considerable wet land in the bottoms, and peat will probably be found there. The average crops are: corn, 60 to 80 bushels; wheat, 15 to 20; sorghum, 150 to 200 gallons.

The bottom-lands of Maple Creek are from one to one and a half miles wide, and the divide is made up of gently undulating prairie. The bottoms contain considerable hard timber, but it is usually scattered and in clumps.

## SHELL CREEK VALLEY.

The bottom-land of Shell Creek Valley is from one to two miles wide. It is the most beautiful valley on the north side of the Platte. The divide is broad, composed of gently undulating prairie, and well watered with streams, as may be seen by reference to the map. Sloughs are of less frequent occurrence than in the valleys of the other streams. Hard timber is found along the banks, which are quite high. All the smaller streams flowing into it are subject to great fluctuations. The average crops to the acre are: corn, 40 to 60; wheat, 12 to 16 bushels.

On the south side of the Platte the country is higher, but in its main features does not differ from the north side. The character of the land is nearly the same. The amount of timber is considerably less.

The valleys of the two principal streams, Skull and Salt Creeks, do not differ from those of the streams North. The water of Salt Creek is slightly brackish in low water.

## AGRICULTURE.

Farming is conducted throughout the Territory without any regard to the future value of the land. The country is but thinly settled; the land is cheap, and its owners are too frequently either ignorant that their system of farming is exhausting the soil, or indifferent to it. Very little if any manure is used, and, except in rare instances, the manure of the stable and farm-yard is either carted into the road or thrown into pits. The farmers find it too much trouble to place it on their fields, because they think the soil so rich that there is no danger of exhausting it. They generally plant the same crop year after year, and when the land no longer yields sufficiently, the field is abandoned. This injudicious system is ameliorated by the fact that large portions of the Territory are devoted to grazing. The manure of the stock restores to the soil a large part of the mineral constituents taken from it, thus contributing to enrich the ground which is not cultivated. The cultivated soils are allowed to regain their fertility by rest and the accumulation of the ashes of the weeds.

The farmers in Iowa are commencing to learn, by their decreasing crops, that such a system will eventually wear out their land. The farmers in Virginia and New York have already learned it. If the soil is to remain fertile, the farmer must return to it a portion, at least, of the mineral constituents which the plant removes from it, in about the same physical condition as the plant found them; for the fertility of the soil does not depend so much on the exact proportion of the ingredients it contains, as it does upon its physical condition, which renders them more or less easy of absorption by the plant. If, under the stimulus of large crops and a ready market, the soil is robbed, the large crop will soon become a small one, and the rich bottom-lands will refuse

to yield, as they have done in Virginia. The soil, if it is to be rich, must be kept so, and its constituents taken away in the crops must be restored to it. The reason why the lands are so rich now, is that the ashes of the plants have been restored to the soil every year, either by the decay of the plant or the burning of the prairie. Where these ashes have accumulated a short bluish grass grows, which is so nutritious that the cattle seek it first.

It is a very easy thing for the short-sighted farmer to raise from twenty to thirty bushels of spring wheat for four or five years successively from the same land; but if such a system is continued, it will reduce the crop, as it has done in some places in New York, to five.

The average yield of the ground can be kept up by changing the crop, top-dressing, and subsoil ploughing. The use of the subsoil plough is especially beneficial in all parts of the country where the bluff-marl comes near the surface. This marl contains a certain percentage of silica and lime, and is frequently the only manure the soil needs. Farmers were found surprised and delighted with crops produced where a little unintentional subsoil cultivation had mixed this marl with the soil, and equally disappointed at the results of surface cultivation near by, where the ground had not been turned more than two inches, even when top-dressed.

Most of the crops are raised by machine-labor, for which the nature of the surface is very well adapted. This is necessary, on account of the scarcity of laborers and the high wages demanded. Ground which is broken during the Summer with the prairie-plough, to the depth of two or three inches, and planted the next Spring, yields abundant crops. Even when the ground is ploughed in the Spring and planted, it produces a fair crop. These crops are usually put in, cultivated, and reaped by machines, at a much less expense and with greater yield than could be obtained by hand-labor.

Lands designed for grazing in the Spring, are burned over in the Fall, in order to secure a sweet and early grass for the stock. In the Spring, the portion destined for hay is burned again. The grass is cut and the hay made entirely by machine, and is stacked in the fields or near the house for winter use.

Buildings used for the protection of stock during the Winter

are generally made of poles. The sides are woven with hay. To form a roof, poles are placed close together, hay is laid over them, other poles are fastened at right angles to these over the hay, thus making a tight and secure roof against both rain and wind.

Not unfrequently these buildings, as well as the dwellings, are made of pieces of turf piled together and cut smooth with a spade. This kind of construction makes a very warm dwelling and a cheap shelter for stock. The log or frame houses of some of the best farmers frequently have their additions constructed in this manner. They last a long time and are easily repaired.

All garden vegetables are easily cultivated, and do well. Fruit, however, does not thrive unless it is protected against the high winds. The wild plum grows with great luxuriance in small natural orchards. The plums are gathered by the farmers and preserved for winter use.

It is probable that if the system of low training in use in some countries were adopted here, the culture of fruit-trees would be more successful. The low tree protects itself, while the tall one is frequently thrown out of the ground by the wind. If the ground were devoted exclusively to fruit, and the trees trimmed low and planted nearer together, they would protect themselves and yield abundant crops.

The average yield of the crops of the whole Territory, for the years 1863 and 1864, is given below. The statistics for 1865 have not yet been published. All these crops, with the single exception of potatoes, are above the average yield for the whole United States, in 1864, while those for 1863 far exceed it. These statistics have been compiled from the Reports of the Patent Office.

| | 1863. | | 1864. | |
|---|---|---|---|---|
| Spring Wheat | 20 | bushels to the acre | 14 | bushels to the acre. |
| Rye | 30 | " " " | 16 | " " " |
| Barley | 43 | " " " | 20 | " " " |
| Oats | 33 | " " " | 28 | " " " |
| Corn | 33.5 | " " " | 28.5 | " " " |
| Potatoes | 82.5 | " " " | 51.6 | " " " |
| Hay | 1.25 | tons " " | 1.3 | tons " " |

TABLE OF STOCK FOR 1864.

| | Number. | Average Price. |
|---|---|---|
| Horses | 9,687 | $ 85.79 |
| Mules | 1,130 | 121.90 |
| Oxen | 53,606 | 26.46 |
| Cows | 17,449 | 30.63 |
| Sheep | 10,872 | 3.10 |
| Hogs | 32,889 | 9.93 |

## FENCES.

Most of the farmers fence their land with wood. The whole farm is usually included in one enclosure. The fence consists of upright posts, to which either split rails or young saplings are nailed. Some of the fences are made of boards. The rail fences are generally made of oak and cotton-wood. The islands of the Platte abound in cedar, which furnishes the posts for many farmers. The posts are sometimes made of locust, when it can be had.

Occasionally trees such as the cotton-wood, locust, and white willow, are planted for hedges, and after a few years afford very good protection against animals.

Hedges are growing in favor, and have been successfully cultivated in many parts of the Territory.

When wood cannot be had, it is the custom to dig a ditch and throw up the earth so as to form a mound. This answers for protection against stock.

The willow or cotton-wood fence is easiest made. It can be made from large cuttings. If these cuttings are taken from one to two inches in diameter, and five feet long, and are planted nine inches apart, twigs can be twined between them immediately, so that they will form a good fence. Almost all of the cuttings are sure to grow, and in a few years the tops will furnish a considerable amount of fire-wood. This system has been put into practice successfully in some portions of France and California.

The stock is allowed to run at large over the prairie, the farmers being generally responsible to each other for the damage done by trespass. Where there are no fences, there is usually a herd-law. The cattle are herded for so much a head, and the herder made responsible for damage done.

## TREE PLANTING.

The greatest want of the country is timber. Until within comparatively few years, the prairie-fires have killed the young growths, except in places where there was some natural protection against them, as on the banks of sloughs or streams, or in some bottoms of the rivers.

This defect can be easily remedied, as there are several kinds of trees which grow rapidly after a year or two of protection.

On all the bottom-lands the cotton-wood (*Populus Monilifera*, Gray), grows readily, and without cultivation. In many places the farmers plough and weed it out, to prevent its taking possession of their lands. It also grows well on the higher lands, especially when its roots can penetrate the yellow siliceous marl. In five or six years the cotton-wood is large enough to be cut for fire-wood, and it is very doubtful whether any crop the farmer can plant will yield him such ample returns.

The scrub oak, the common and the slippery elm, ash, walnu and hickory, grow on the bluffs of almost all the rivers. This bluff-soil seems to be particularly adapted to the oak, which sends its roots down into it to a considerable depth. When these roots die, the marl becomes filled with holes, and more or less porous. Wherever this soil comes near the surface, groves of hard timber spring up. On Pawnee Creek and at Fairview large tracts of hard-wood brush were seen, which had been protected from the fires for three years, and which, in the course of one or two years more, would no longer require watching. A little judicious thinning out is all this brush needs to make it valuable timber in the course of ten or fifteen years.

Trees are easily cultivated if a little attention is given to them; they require less care than any other crop, and will yield larger returns. Every farmer should plant trees, not only because he needs the wood for fuel, but because they are needed for building, for fences, and to protect his stock.

It is a fact well known to eastern farmers that grain which is protected from the winds by trees, even though the trees are at some distance, is less likely to be winter-killed. Their protection is not only required for grain, but also for fruit as well as for stock. There are many places on the plains where fruit will not grow unless protected against the winds by trees. Many of the farmers in the eastern counties are beginning to see the importance of this, and have been planting extensively within the last four or five years. They feel the effects of the trees almost immediately in the increase of their crops and in the comfort of their houses. One of them, who had planted three years before, remarked that he could see a very perceptible difference in the amount of fuel consumed, and in the yield of wool from his sheep. He found less liability to disease, and a very marked difference in the general condition of all his stock, so

much so that he should continue to plant. Trees are not only a protection against the cold produced by the high prairie-winds, but they are also a protection against the hot sun of the Summer and form a very grateful refuge for stock.

Many of the farmers are in the habit of planting trees, especially cotton-wood or locust, as a hedge. It requires very little care, though the locust is liable to be attacked by borers, and is much less certain than the cotton-wood, or the white willow, which grows almost as fast as the cotton-wood, and is preferable for some purposes. If there is no other protection, the trees should be planted three rows deep in quincunx. A hedge of this kind becomes impassable to cattle in a few years, and is the least expensive fence that can be made. If the trees are planted nine inches apart and twined with brush, it will be of service immediately.

If trees were planted on a large scale all over the Territory, there is little doubt that they would mitigate the effects of the high winds and reduce the extremes of heat and cold. Keeping a large amount of ground protected from the sun, and preventing that sudden drainage of the surface which is now changing the topography of the country little by little, they would have a tendency to increase the amount of rain by the slow evaporation of moisture from the surface of the leaves, and at the same time cause a more equal distribution of it. The extraordinary health of the prairies is doubtless owing to the high winds, which prevent the malarious gases, arising from decomposing vegetation, from collecting in any one place. While the planting of trees would so materially reduce the force of this wind as to add to the comfort of the settler and the health of his stock, there could be no fear that it would affect the health of the country. Experience has shown that the growth of trees is beneficial in this respect. The malarious gases that escape from decomposing vegetation, are compounds of carbon. The leaves of the trees eagerly seek these compounds, decompose them, assimilate the carbon to themselves, and render the gases not only powerless for harm, but liberate a certain amount of oxygen, which revivifies the air. The trees then purify the air, at the same time that they accumulate the carbon for the future use of the farmer.

While the trees are young they require very little care, which consists in preventing them in the first few years from being

choked by weeds, and in keeping out the prairie-fires. This is necessary, because the want of frequent rains renders the grass liable to take fire at any moment. The fire, once kindled, spreads rapidly, and young trees are very generally destroyed by it.

Cotton-wood grows so vigorously that it is the natural protector of the other trees. The harder trees should be planted with it, since the cotton-wood furnishes the trees of slower growth the protection which they require from the weather. When they have attained the proper size, the cotton-wood can be gradually thinned out, and the harder trees, which have been raised either from the seed or the cuttings, will then be old enough to bear transplanting. In this way, with little care, a plantation of trees can be made productive to the farmer at the end of a few years, and will well repay the trouble, not only by the interest on the capital invested, but also in the greater amount of his own comfort, and the increased health of the stock.

## MINERALS.

The portion of the Territory included in this survey contains few minerals, and these, for the most part, of little importance.

### COAL.

Coal has not as yet been found within the limits of this survey in workable beds. Thin seams are worked to some extent near the surface, in the southern part of the Territory. Coal is said to have been found in Johnson, Nemaha, Pawnee, and Richardson counties; but no authentic information was obtained concerning the beds worked. It is quite probable that some of the upper ones, which are usually thin, crop out there. There is very little doubt, however, that the bed measuring six feet in thickness will be found by a boring; and from such basis for calculation as can be obtained, it is probable that it will be within a workable distance from the surface.

### PEAT.

It is probable that peat-beds, similar to those in the eastern States, will be found in Nebraska, especially in the vicinity of sloughs, or of lands which are wet during a certain portion of the year. Quite a number of muck-bogs may be seen on the bot-

toms of the Platte, the Elkhorn, and Pebble Creek. These bogs sometimes become so dry as to burn down several inches when the prairie takes fire in the Fall of the year.

The peat is not only valuable for fuel, but also for manure. For heating purposes it has a value almost equal to the poorer kinds of coal, and if properly manufactured will prove an excellent fuel.

## IRON.

Iron ores, of a quality that can be worked to advantage, are not found. A few scattered pieces of limonite (hydrated sesquioxide of iron) are found in the drift, and in the sandstone of the Cretaceous period; but they are too siliceous and too poor to be worked with success.

In some explorations on Calahan Creek, there were occasionally found small pieces of compact carbonate of iron of the Coal Measures. They did not appear to be abundant. It is possible that this variety may be found in making explorations for coal.

## MANGANESE.

An ore of manganese is found in a stratum about six inches thick, covering the limestone of the Coal Measures at Larimer's Mills. It is also found at Fontinelle. It is called black sandstone among the farmers, and will probably be of no commercial importance.

## BUILDING-STONE.

The limestone of the Coal Measures furnishes excellent building-stone, and is quarried extensively at Omaha, Bellevue, and Larimer for that purpose. No proper attention has been paid to the method of quarrying. It is done in the rudest way, by stripping off the earth; and as there is a limit beyond which this can no longer be profitably done, the quarries are never extensive, and the stone is of constantly varying quality. The quarries on Pawnee Creek furnish a limestone so soft that it can be cut with a saw and planed, like the building-stones around Paris. It grows hard upon exposure, and makes a beautiful building-stone.

The Cretaceous sandstones are used to some extent for foundations. These quarries cannot be depended upon, since the

stone varies in quality. It is prized by the farmers, however, since where it is found it is the only rock.

## GRAVEL.

Gravel and fine sands are found either on the bottoms of most of the rivers, or a short distance below the surface, and will be found useful for building purposes.

## LIME.

The limestones of the Coal and Cretaceous formations furnish very good materials for making lime. It can be manufactured very cheaply, and requires no masonry. An excavation of the required size and shape is made in the bluff, which, after the first fire, will become hardened, and retain its shape for a long time. The necessary openings are cut through from below, and require no support. When a kiln is burned it is covered over, to protect it from the weather, and the lime drawn out as required.

## HYDRAULIC CEMENT.

It is probable that stone suitable for making hydraulic cement will be found. Some layers have all the exterior characters of the hydraulic limestones. It is impossible to tell, without trial, whether they are suitable for that purpose.

## ARTIFICIAL BUILDING-STONE.

An artificial building-stone is growing in favor in Europe, and is much used in Paris for certain purposes. It consists of a mixture of sand and lime, with or without cement, in certain proportions, according to the nature of the stone required. Its introduction at Omaha has been undertaken by a company, and it will probably be found economical, as the materials of which it is made occur in great abundance.

## BRICK.

The marl and clays of the bluff and the alluvial sands furnish very good materials for manufacturing brick, and are much used for that purpose. Machines are about to be introduced for the manufacture of bricks, which will furnish them

cheaper and of better quality than those made by hand. As the materials for their manufacture are distributed over a very large area, brick and the artificial building-stone will probably supersede wood in constructions.

## MILL SITES.

The smaller streams which have high earth banks furnish excellent sites for mills. Up to this time, but few dams have been built, owing partly to the failure in the structure of some, from want of knowledge, and partly to the fact that the Territory is yet too thinly settled to demand many mills.

## CONCLUSION.

It is evident from the foregoing description that Nebraska must remain an agricultural country. For this it is destined by its geographical position, no less than its fertile soil and its climate. Traversed by the great highway to the Pacific, and connected, therefore, by the shortest route, with the central mining districts of the continent, it cannot fail to find, beyond its western borders, a permanent market for its staple products. The facility afforded by its topography for the cultivation of large areas by machine-labor, will enable Nebraska to keep pace with the increasing demand of the future. Having once supplied the great western market, it will control it, and the gold and silver of the mountains will be exchanged in this Territory for grain and stock. Adding to these favorable conditions the present inducement of abundant cheap land, it is not difficult to foretell for this region a rapid increase of population, and a prosperous future.

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